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ABSTRACT

This study sought to determine to what extent the setting of university records in objectively measurable performances in track and field, and in swimming, exceeded normal probability during the positive phases of the record setters' biorhythm cycle. According to the biorhythm theory, the positive period of these cycles would be the best times for record athletic performance. Two hundred and nine athletes participated in the study, 158 males and 51 females, ranging between the ages of 17 and 28. Seven statistical hypotheses were tested with a chi-square analysis. None of these hypotheses could be rejected. The analysis indicated that none of the biorhythms or their combinations appear to be a contributing factor in athletic record setting performance at the .05 level of significance. It is concluded that there is no reason to believe that university record setting would be influenced by biorhythms in any manner. Recommendations are made in regard to the future studying and use of biorhythms. (Author/JD)

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THE RELATIONSHIP BETWEEN RECORD SETTING ATHLETIC PERFORMANCE AND BIORHYTHMS

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ABSTRACT

The purpose of the study was to determine to what extent the setting of university records in objectively measurable performances in track and field, and in swimming exceeded normal probability during the positive phases of the record setters.

Five universities were chosen based upon (a) the fact that each university sponsored athletics for both men and women, and (b) there were one or more administrators or faculty members in each school who could help to obtain data required for the study. The study included only those teams having been in existence for more than a year and those records for which the following variables about the individual record holders could be obtained: (a) the sport in which the record was set; (b) the sex of the athlete; (c) the date on which the record was set; and (d) the athlete's date of birth, and (e) the age of the athlete.

There were 209 athletes in this study, 158 being males and 51 females. The ages ranged from 17 to 28, the mean age for males being 20.3 years, for females 19.8 years.

Seven statistical hypotheses were tested with a chi-square analysis. None of these hypotheses could be rejected.

According to the biorhythm theory, the positive periods of these cycles would be the best times for record athletic performance. However, as tested by the chi-square analysis of this study, none of the biorhythms or their combinations appear to be a contributing factor in athletic record setting performance at the

.05 level of significance. Therefore, there is no reason to believe that university record setting would be influenced by biorhythms in any manner.

The basic concepts of human biological rhythms have been well substantiated in research over a period of years. These concepts include, but are not limited to, the monthly rhythms of the human female plus the daily rhythms of temperature, blood pressure, pulse rate, hormonal levels, and levels of amino acids in both sexes (Sollberger, 1965, 1975; Conroy & Mills, 1970; Luce, 1970, 1971; Colquhoun, 1971). Research substantiating these concepts has been done in the fields of biochemistry, biology, medicine, pharmacology, endocrinology, and psychobiology (Sollberger, 1965, 1975; Luce, 1971). Hundreds of such research publications have appeared in scientific journals.

In contrast, the concepts of biorhythms are lacking in research support but abound in propaganda.

INSERT FIGURE 1 ABOUT HERE

Biorhythms which consists of a 23-day physical, a 28-day emotional and a 33-day intellectual cycle are distinguished from biological rhythms in that they focus on variability in human performance over specified periods of days and are determined by the birth data of the individual. The research on biological rhythms reveal that they affect each other and have a direct effect on human functioning (Sollberger, 1965, 1975; Conroy & Mills, 1970; Luce, 1970, 1971; Colquhoun, 1971). Biorhythms are based upon

theory rather than research, this theory predicting human performance from unchanging cycles calculated by the birth date. Quite naturally, researchers in biological rhythms cannot logically accept a theory that runs counter to their findings.

The lack of research support would probably not be of importance were it not for the fact that an appreciable number of people are apparently utilizing the concepts of biorhythms for decision making and for planning in their everyday activities. This trend is aided by the thriving business in hand calculators and other devices to simplify the computation of biorhythm periods, plus newsletters, periodical articles, and books testifying to the predictive efficiency of biorhythms.

The biorhythm research that has been conducted has focused on the negative aspects of the various biorhythm cycles. In some sense, biorhythms have been interpreted more as predictors of bad news rather than as bearers of good tidings. This interpretation probably has been a function of the availability of accident data for research, rather than from any conscious intent on the part of the researchers. However, the accumulative data from the accident research of the 1970's (Mason, 1971 as reported by Wolcott, McMeekin, Burtin & Yanowitch, 1976, 1977, and in press at the time of writing of this article) does not support the concepts of biorhythms. As this research finds its way to the popular literature, there will be a necessity to turn to other concepts to support the theory, at this time the positive concepts being a

possibility. This study investigated a particular aspect of these positive concepts.

The review of literature revealed a considerable number of articles investigating the "critical days" hypothesis where the cycles are crossing the zero-line in relationship to various kinds of accidents. However, most of the studies seemed to be analyses of available data on accidents without operational definitions of the presented concepts. Some of the evidence appeared to be for the concepts, but the majority fail to provide any support. Although some articles suggested objective athletic performance as a possible means of study of the positive phases, at the time of the writing of this article, only one study conducted in the Soviet Union concentrated on the positive phases of biorhythms.

The purpose of the study was to determine to what extent the setting of university records in objectively measurable performances in track and field, and in swimming exceeded normal probability during the positive phases of the record setters.

There were two major data treatments in this study. One of these was the calculation of the day of the record setting in each of the biorhythm cycles. This was accomplished in the same manner as the normal biorhythm calculations take place, by adding together days lived, and drawing a graph for the specific month in question. With the use of this graph a researcher could then pinpoint a date when a record was set, and then observe whether the three cycles are in the positive or negative phases. In this specific

example, the records were set on June 3, 1972 indicating all positive cycles at the time of the record setting. This study made use of a computer program (Schneider, 1977) to compute the actual positive or negative values of the biorhythm.

Along the sine-curve the biorhythm values seen here are used for the computation of the cycles in question.

0.0	0.0	0.0
0.27	0.22	0.19
0.52	0.43	0.37
0.73	0.62	0.54
0.89	0.78	0.69
0.98	0.90	0.81
1.00	0.97	0.91
0.94	1.00	0.97
0.82	0.97	1.00
0.63	0.90	0.99
0.40	0.78	0.95
0.14	0.62	0.87
-0.14	0.43	0.76
-0.40	0.22	0.62
-0.63	0.00	0.46
-0.82	-0.22	0.28
-0.94	-0.43	0.10
-1.00	-0.62	-0.10
-0.98	-0.78	-0.28
-0.89	-0.90	-0.46
-0.73	-0.97	-0.62
-0.52	-1.00	-0.76
-0.27	-0.97	-0.87
	-0.90	-0.95
	-0.78	-0.99
	-0.62	-1.00
	-0.43	-0.97
	-0.22	-0.91
		-.0.81
		-0.69
		-0.54
		-0.37
		-0.19

The second major data treatments of the study were the chi-square tests of hypotheses. The expected values for each of

the cycles were calculated. Using a 23-day cycle as an example, this would be accomplished in the following way. An operational definition of the biorhythm was first developed in which the positive phase would be computed as the first half on the particular cycle minus the first and the last day of the first half of the cycle. This would constitute a correction of plus or minus one day in the birth date. This correction works well with the 28-day cycle in which the positive phase becomes second to the thirteenth day inclusively of the cycle.

The correction does not work well with the 23-day and 33-day cycles, however, because the correction would yield a fractional day as part of the positive phase. Because a fractional day is difficult to cope with in terms of meaning, a correction for the 23-day and 33-day cycles was changed to the first half of the cycle. For the purposes of this study, it was assumed that (1) every record setter was born at 12 noon on the birthday, and that (2) all events take place after 12 noon on the day of record setting. During a true critical day (zero-day on the computer program) this will not create any problem. However, if a situation would arise where two days are assigned values opposite in sign, with no day assigned zero between them the critical period would include a part of both of them. It is assumed that all events occurring after 12 noon on the first day and before noon on the second day would occur on a critical period. Since the events generally occur only in the afternoon, only the first day will be

counted as a critical period, thus avoiding excess amount of critical days when turning down from the positive phase to the negative phase. This means that there are ten positive days in the 23-day physical cycle, and 15 positive days in the 33 day intellectual cycle. The amount of positive days in the 28-day emotional cycle is 13.

These operationally defined positive phases were developed to make sure that no negative phase days were accidently included in the tests of positive phases. The operational definitions could also be viewed as the taking out of the "critical days" from the positive phases. Regardless of the way in which the operational definitions are viewed, they constitute the development of a "purified" positive phase for testing purposes.

The positive phase of the 23-day cycle has been operationally defined as ten days in which the sine-curve is above the center line.

INSERT TABLE 1 HERE

This means that the expectation of the occurrence of records by chance in this positive phase would be 10/23 or 43n. If the number of records was 209, the chi-square test would have a form as illustrated in Table 1.

Results

There were 209 record setters in the study. Of these, 158 were males and 51 females. The track and field athletes numbered 127 (93 males and 34 females), and the swimmers numbered 82 (65 males and 17 females). (Table 2).

INSERT TABLE 2 HERE

The ages ranged from 17 to 28, the mean age for the males being 20.3 years, for females 19.8 years.

Seven statistical hypotheses were tested with a chi-square analysis. (Table 3). None of these hypotheses could be rejected.

INSERT TABLE 3 HERE

Conclusions

According to the biorhythm theory, the positive periods of these cycles would be the best times for record athletic performance. However, as tested by a chi-square analysis in this study, none of the biorhythms appear to be a contributing factor in athletic record performance at the .05 level of significance. Therefore, there is no reason to believe that university record setting would be influenced by biorhythms in any manner.

Recommendations

As a result of this investigation, the author wishes to make the following recommendations in regard to the future studying and utilization of biorhythms:

1. Biorhythms should not be used as predictors of individual performance until further evidence of their possible influences has been provided.
2. This study did not support the use of the assumed fixed 23-day, 28-day, and 33-day cycles. However, Neil & Sink (1976) identified cycles similar to the biorhythms in length in three individuals. The length of these cycles appeared to vary among the subjects, suggesting that they cannot be calculated in the same manner as biorhythms are being calculated. Research on these other infradian (long biological) cycles should be conducted in various settings to investigate their role in human performance.
3. Future studies similar to the present one should include the following important points:
   (a) exact times and places of birth
   (b) exact times and places of records set
   (c) a larger number of subjects than included in this study, and
   (d) an analysis of different kinds of sports, including long distance running and swimming.

4. Longitudinal study of individuals who have set records in the positive phases of the cycles should be conducted to see if any pattern of further accomplishments in relationship to the biorhythms is evident.

TABLE 1

Illustration of Chi-square Tables

Category	f_e	f_o	X^2	P
Records in	.43 x 209 = 89.87	91	.014	
Records not in Positive Phase	.57 x 209 = 119.13	118	.011	
	df = 1	ξ = .025		.80

In this computation, the notations are to be read:

f_e = frequency expected

f_0 = frequency observed

TABLE 2

Distribution of Subjects by Sex and Athletic Event

Athletic Event	Sex					
	Males		Females		Total	
	N	%	N	%	N	%
Track	93	58.9	34	66.7	127	60.8
Swimming	65	41.1	17	33.3	82	39.2
Total	158	100.0	51	100.0	209	100.0

TABLE 3

Summary of Hypotheses Testing

Statistical Hypothesis		Can Be Rejected
1.	The occurrence of records in the positive phase of the 23-day cycle would not be significantly greater at the .05 level than would occur by chance.	no
2.	The occurrence of records in the positive phase of the 28-day cycle would not be significantly greater at the .05 level than would occur by chance.	no
3.	The occurrence of records on the positive phase of the 33-day cycle would not be significantly greater at the .05 level than would occur by chance.	no
4.	The joint occurrence of records in the positive phases of the 23-day and 28-day cycles would not be significantly greater at the .05 level than would occur by chance.	no
5.	The joint occurrence of records in the positive phases of the 23-day and 33-day cycles would not be significantly greater at the .05 level than would occur by chance.	no
6.	The joint occurrence of records in the positive phases of the 28-day and 33-day cycles would not be significantly greater at the .05 level than would occur by chance.	no
7.	The joint occurrence of records in the positive phases of all three cycles would not be significantly greater at the .05 level than would occur by chance.	no

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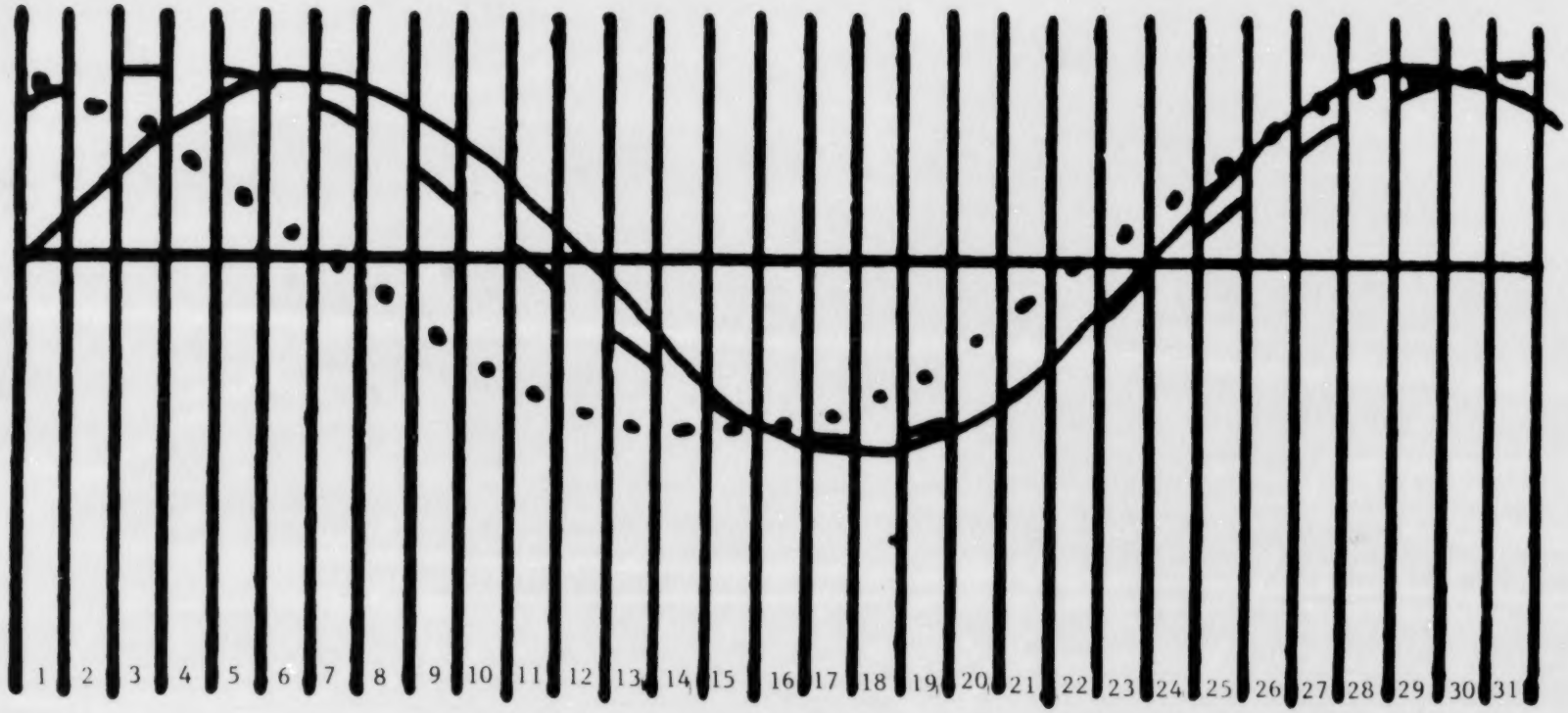

Figure 1. Biorhythm chart illustrating the physical, emotional and intellectual cycles.